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UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

IBORMEITH IP, LLC,	:	Hon. Faith S. Hochberg, U.S.D.J.
Plaintiff,	:	Civil Case No. 10-5378 (FSH) (PS)
v.	:	**OPINION**
MERCEDES-BENZ USA, LLC, et al.,	:	Date: September 5, 2012
Defendants.	:	

HOCHBERG, District Judge:

This case comes before the Court on Defendants Mercedes-Benz USA, LLC's and Daimler AG's (collectively, "Mercedes") Motion for Summary Judgment of Indefiniteness with respect to certain claims of U.S. Patent No. 6,313,749, titled "Sleepiness Detection for Vehicle Driver or Machine Operator," (the "'749 patent"). The Court has reviewed the submissions of the parties and considered the motion on the papers in accordance with Fed. R. Civ. P. 78. Also pending before the Court are the parties' submissions regarding their disputed proposed construction of several claim terms in the '749 patent.

I. BACKGROUND

Plaintiff Ibormeith IP, LLC ("Ibormeith") brings this action for infringement of the '749 patent. The '749 patent was issued to inventors James Anthony Horne and Louise Ann Reyner on November 6, 2001 and subsequently transferred to Ibormeith, a non-practicing entity. Ibormeith asserts that Mercedes's Attention Assist feature infringes claims 1, 5, 8 and 9 of the '749 patent. Claims 5 and 8 depend from claim 1 and therefore contain each claim limitation in

that claim. Claims 1 and 9 both contain a "computational means" limitation, which the parties agree is a means-plus-function limitation performed by a computer and governed by 35 U.S.C. § 112 ¶ 6. "As such, the specification of the ['749] patent must contain an algorithm [or algorithms] to perform the function [or functions] associated with the ["computational means"] limitation, or the limitation is indefinite." *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1305 (Fed. Cir. 2012).

A. The '749 Patent

The '749 patent claims a sleepiness monitor for vehicle drivers or machine operators. The monitor functions by "taking account of circadian and sleep parameters of an individual vehicle driver, and/or generic or universal human physiological factors, applicable to a whole class or category of drivers" and integrating that information with "'real-time' behavioural sensing, such as of road condition and driver control action, including steering and acceleration, to provide an (audio-) visual indication of sleepiness." '749 patent col.2 ll.55-62.

The specification teaches that there is a known pattern of human predisposition to sleepiness over a 24-hour period (commonly known as circadian rhythm), where likelihood of falling asleep is greatest during early morning and mid-afternoon hours. *Id.* at col.2 ll.43-50. According to the specification, the monitor functions by combining time of day predisposition to sleepiness with a number of other factors affecting a driver's likelihood of falling asleep. The specification discloses that some of these factors are specific to the individual driver—such as recent sleep patterns—and are inputted directly by the driver into the monitor system. Other factors, such as steering behavior, light conditions, cabin temperature, road conditions, and trip duration are measured by sensors in the vehicle. The specification teaches that these "inputs being individually weighted, according to contributory importance," are "combined in a

computational decision algorithm or model, to provide a warning indication of sleepiness." *Id.* at col.3 ll.38-42.

The preferred embodiments section of the specification provides the following description of certain aspects of the invention:

> An internal memory module may store data from various remote sensors, 13, 15, 27, 29, 31—together with models or algorithms of human body circadian rhythms and weighting factors to be applied to individual sensory inputs.
>
> An internal microprocessor is programmed to perform calculations according to driver and sensory inputs and to provide an appropriate (audio-)visual warning indication of sleepiness through the display screen 18.

Id. at col.8 ll.10-17.

Mercedes contends that the two means-plus-function claim limitations in Claims 1 and 9 (set forth in **bold**) are indefinite, thereby rendering Claims 1 and 9 invalid. Mercedes also asserts that the two *italicized* claim terms in Claim 1 are indefinite:

> 1. A sleepiness monitor for a vehicle driver, or machine operator, comprising:
>
> a sensor for sensing a driver or operator control input;
>
> a memory for storing an *operational model* that includes a physiological reference model of driver or operator circadian rhythm pattern(s) and a *vehicle or machine operating model or algorithm*;
>
> **computational means for weighting the operational model according to time of day in relation to the driver or operator circadian rhythm pattern(s) and for deriving from the weighted model, driver or operator sleepiness condition and producing an output determined thereby**; and
>
> a warning indicator triggered by the computational means output, to provide a warning indicator of driver operator sleepiness.
>
> . . .
>
> 9. A sleepiness monitor for a driver and vehicle, comprising:
>
> a sensor for sensing a steering movement, about a reference position;
>
> a memory, for storing a circadian rhythm pattern or time-of-day physiological reference profile of predisposition to sleepiness; and

> **computational means for computing steering transitions and weighing that computation according to time of day, to provide a warning indication of driver sleepiness**.

Id. at col.16 ll.13-30, 50-61 (emphasis added).

B. Procedural History

The parties filed claim construction briefs disputing the construction of five claim terms in the '749 patent and the Court held a claim construction hearing on April 25, 2012. In its claim construction briefs and at the hearing, Mercedes argued that the means-plus-function "computational means" limitations in Claims 1 and 9 are indefinite, thereby rendering Claims 1 and 9 invalid. Due to the significance of the "computational means" claim limitations to this action,[1] the Court reserved its ruling on claim construction and, with their consent, instructed the parties to brief summary judgment on indefiniteness.

II. STANDARD OF REVIEW

Pursuant to Federal Rule of Civil Procedure 56(c), a motion for summary judgment will be granted if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of law. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 247 (1986); *Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986). In other words, "[s]ummary judgment may be granted only if there exists no genuine issue of material fact that would permit a reasonable jury to find for the nonmoving party." *Miller v. Ind. Hosp.*, 843 F.2d 139, 143 (3d Cir. 1988). All facts and inferences must be construed in the light most favorable to the non-moving party. *Peters v. Del. River Port Auth.*, 16 F.3d 1346, 1349 (3d Cir. 1994). The judge's function is not to weigh the evidence and determine the truth of the matter,

[1] In their Revised Joint Claim Construction Chart, required by Local Patent Rule 4.3, the parties ranked the "computational means" limitations from Claims 1 and 9 as the two most significant claim terms requiring construction.

but to determine whether there is a genuine issue for trial. *See Anderson*, 477 U.S. at 249. "Consequently, the court must ask whether, on the summary judgment record, reasonable jurors could find facts that demonstrated, by a preponderance of the evidence, that the nonmoving party is entitled to a verdict." *In re Paoli R.R. Yard PCB Litig.*, 916 F.2d 829, 860 (3d Cir. 1990).

The party seeking summary judgment always bears the initial burden of production. *Celotex*, 477 U.S. at 323. This burden requires the moving party to establish either that there is no genuine issue of material fact and that the moving party must prevail as a matter of law, or to demonstrate that the nonmoving party has not shown the requisite facts relating to an essential element of an issue on which it bears the burden. *Id*. at 322-23. This burden can be "discharged by 'showing' . . . that there is an absence of evidence to support the nonmoving party's case." *Id*. at 325. Once the party seeking summary judgment has carried this initial burden, the burden shifts to the nonmoving party.

To avoid summary judgment, the nonmoving party must then demonstrate facts supporting each element for which it bears the burden, thus establishing the existence of a "genuine issue of material fact" justifying trial. *Miller*, 843 F.2d at 143; *accord Celotex*, 477 U.S. at 324. The nonmoving party "must do more than simply show that there is some metaphysical doubt as to material facts." *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 586 (1986).

"Where the record taken as a whole could not lead a rational trier of fact to find for the non-moving party, there is no 'genuine issue for trial.'" *Id*. at 587 (quoting *First Nat'l Bank of Ariz. v. Cities Serv. Co.*, 391 U.S. 253, 289 (1968)). Further, summary judgment may be granted if the nonmoving party's "evidence is merely colorable or is not significantly probative." *Anderson*, 477 U.S. at 249-50.

III. DISCUSSION

The 35 U.S.C. § 112 ¶ 2 definiteness requirement provides that a patent's claims must "particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention." Section 112 ¶ 6 allows for means-plus-function claiming where "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." Thus, means-plus-function claiming permits a patentee to claim a means for performing a certain function as long as the structure, material, or act is disclosed in the specification. "[T]he scope of the claim limitation [must] be defined by the structure disclosed in the specification plus any equivalents of that structure; in the absence of structure disclosed in the specification to perform those functions, the claim limitation would lack specificity, rendering the claim as a whole invalid for indefiniteness under 35 U.S.C.§ 112 ¶ 2." *Aristocrat Techs. Australia PTY Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1331 (Fed. Cir. 2008) (citing *In re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc)). "A determination that a patent claim is invalid for failure to meet the definiteness requirement of 35 U.S.C. § 112, paragraph 2, is a legal conclusion." *Intellectual Prop. Dev., Inc. v. UA-Columbia Cablevision of Westchester, Inc.*, 336 F.3d 1308, 1318 (Fed. Cir. 2003) (internal quotation omitted).

The structure corresponding to the function in a means-plus-function claim must be "clearly link[ed] or associate[d] . . . to the function recited in the claim" by the specification or prosecution history. *B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir. 1997). Additionally, the corresponding structure disclosed "must be adequate; the patent's specification must provide 'an adequate disclosure showing what is meant by that [claim] language. If an

applicant fails to set forth an adequate disclosure, the applicant has in effect failed to particularly point out and distinctly claim the invention as required by [§ 112 ¶ 2].'" *Noah Sys., Inc. v. Intuit Inc.* 675 F.3d 1302, 1311-12 (Fed. Cir. 2012) (quoting *In re Donaldson Co.*, 16 F.3d at 1195); *see also Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1211 (Fed. Cir. 2003) ("If the specification is not clear as to the structure that the patentee intends to correspond to the claimed function, then the patentee has not paid that price but is rather attempting to claim in functional terms unbounded by any reference to structure in the specification."). "[A] challenge to a claim containing a means-plus-function limitation as lacking structural support requires a finding, by clear and convincing evidence, that the specification lacks disclosure of structure sufficient to be understood by one skilled in the art as being adequate to perform the recited function." *Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1376-77 (Fed. Cir. 2001).

Where a means-plus-function claim limitation is implemented by a computer, the Federal Circuit "has consistently required that the structure disclosed in the specification be more than simply a general purpose computer or microprocessor." *Aristocrat*, 521 F.3d at 1333. This means that the specification must "disclose an algorithm for performing the claimed function." *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1367 (Fed. Cir. 2008); *see also Aristocrat*, 521 F.3d at 1333 ("Thus, in a means-plus-function claim 'in which the disclosed structure is a computer, or microprocessor, programmed to carry out an algorithm, the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm.'") (quoting *WMS Gaming, Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999)). Put another way, "the corresponding structure for a § 112 ¶ 6 claim for a computer-implemented function is the algorithm disclosed in the specification." *Harris Corp. v. Ericsson Inc.*, 417 F.3d 1241, 1253 (Fed. Cir. 2005).

"The usage 'algorithm' in computer systems has broad meaning, for it encompasses in essence a series of instructions for the computer to follow." *Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1384 (Fed. Cir. 2011) (internal quotation omitted). The algorithm required to be disclosed by the specification can be expressed "in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure." *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008). "For computer-implemented procedures, the computer code is not required to be included in the patent specification," but, the disclosure must be sufficient "for a person of skill in the field to provide an operative software program for the specified function." *Typhoon Touch*, 659 F.3d at 1385. Additionally, "the amount of detail that must be included in the specification depends on the subject matter that is described and its role in the invention as a whole in view of the existing knowledge in the field of the invention." *Id.* "Simply disclosing software, however, 'without providing some detail about the means to accomplish the function[,] is not enough.'" *Noah Sys.*, 675 F.3d at 1312 (quoting *Finisar*, 523 F.3d at 1340-41).

Courts can consider expert opinion on the issue of whether a patent's algorithmic disclosure is sufficient to be understood by one skilled in the art as being adequate to perform the recited function. *See Noah Sys.*, 675 F.3d at 1312; *Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1302 (Fed. Cir. 2005). However, when a court determines that no algorithm has been disclosed at all, the Court need not consider the parties' expert testimony. *See Default Proof Credit Card Sys.*, 412 F.3d at 1302 ("[T]he testimony of one of ordinary skill in the art cannot supplant the total absence of structure from the specification.").

Where the specification discloses no algorithm for the computer-implemented means to perform the claimed function, the means-plus-function claim limitation lacks sufficient structure

under § 112 ¶ 6 and is indefinite under § 112 ¶ 2. *See Aristocrat*, 521 F.3d at 1337-38. "When the specification discloses some algorithm, on the other hand, the question is whether the disclosed algorithm, from the viewpoint of a person of ordinary skill, is sufficient to define the structure and make the bounds of the claim understandable." *Noah Sys.*, 675 F.3d at 1313 (citing *AllVoice Computing PLC v. Nuance Commc'ns*, 504 F.3d 1236, 1245 (Fed. Cir. 2007)).

Where, as in this case, a means-plus-function claim element claims a means for performing more than one function, "[a]ny algorithm must . . . address [all] aspects of [the] functional language." *Id.* at 1314. The *Noah Sys.* court further explained:

> [W]here a disclosed algorithm supports some, but not all, of the functions associated with a means-plus-function limitation, we treat the specification as if no algorithm has been disclosed at all. In such instances, we are not faced with a disclosure which addresses itself to an identifiable function, but arguably does so inadequately. We are faced with an identifiable function, which all parties concede is claimed, but as to which there is a total absence of structure. We cannot allow disclosure as to one function to fill the gaps in a specification as to a different, albeit related, function. To hold otherwise would allow a patentee to employ generic functional claiming "unbounded by any reference to structure in the specification." [*Biomedino, LLC v. Waters Techs. Corp.*, 490 F.3d 946, 948 (Fed. Cir. 2007)] (citation omitted). This outcome is impermissible under the plain terms of § 112 ¶ 6.

Id. at 1318-19. Accordingly, the specification of the '749 patent must adequately disclose an algorithm that provides structure in the form of an algorithm to perform each of the functions claimed in the Claim 1 and 9 "computational means" limitations.

A. Claim 1 "computational means" limitation

The parties do not dispute that the "computational means" limitation in Claim 1 requires a "computational means" for performing three functions: (1) "weighting the operational model[2]

[2] The parties dispute the construction of the claim term "operational model." Claim 1 teaches that the "operational model" that is "weight[ed]" by the "computational means" "includes a physiological reference model of driver or operator circadian rhythm pattern(s) and a vehicle or machine operating model or algorithm." '749 patent col.16 ll. 17-20. The Court need not decide claim construction in order to decide indefiniteness.

according to time of day in relation to the driver or operator circadian rhythm pattern(s)"; (2) "deriving, from the weighted model, driver or operator sleepiness condition"; (3) "producing an output determined thereby." '749 patent col.16 ll.21-26. Mercedes asserts that the specification fails to adequately disclose an algorithm for performing these functions. Ibormeith contends that the specification discloses an algorithm corresponding to these three functions in three different portions of the specification: (1) Column 2 Lines 55-62; (2) Column 3 Lines 5-30; and (3) Table 10.

1. Column 2 Lines 55-62

Column 2 Lines 55-62 discloses the following:

> According to one aspect of the invention a monitor taking account of circadian and sleep parameters of an individual vehicle driver, and/or generic or universal human physiological factors, applicable to a whole class or category of drivers, is integrated with 'real-time' behavioural sensing, such as of road condition and driver control action, including steering and acceleration, to provide an (audio-) visual indication of sleepiness.

This portion of the specification does not disclose an algorithm for performing the claimed functions; rather, it restates the claimed functions. For example, "taking account of circadian and sleep parameters" does not tell one skilled in the art how to "weight[] the operational model according to time of day in relation to the driver or operator circadian rhythm pattern(s)"; it simply states that this function is to be achieved. Likewise, disclosing that the circadian rhythm information is "integrated with 'real-time' behavioural sensing, such as of road condition and driver control action, including steering and acceleration," does not explain how the "operational model," which includes "a vehicle or machine operating model," is weighted or how "operator sleepiness condition" is "deriv[ed]" therefrom. This disclosure again restates the claimed function. The disclosure that the above-described integration "provide[s] an (audio-)

visual indication of sleepiness" restates the "producing an output determined thereby" function of Claim 1, but does not disclose an algorithm to perform that function.

Therefore, this portion of the specification (Col. 2, lines 55-62) "merely recite[s] functional, not structural, language." *Noah Sys.*, 675 F.3d at 1317. "This type of purely functional language, which simply restates the function associated with the means-plus-function limitation, is insufficient to provide the required corresponding structure." *Id.*

2. Column 3 Lines 5-30

Column 3 Lines 5-30 is the second location in the specification that Ibormeith argues discloses an algorithm supporting the Claim 1 "computational means" limitation functions; it discloses:

> Overall system capability could include one or more of such factors as:
>
> common, if not universal, underlying patterns or sleepiness (pre-conditioning);
>
> exacerbating factors for a particular user—driver, such as recent sleep patterns especially, recent sleep deprivation and/or disruption;
>
> with a weighting according to other factors, such as the current time of day.
>
> Thus, background circumstances, in particular a natural alertness 'low point'—and attendant sleepiness or susceptibility to (unprompted) sleep—in the natural physiological biorhythmic or circadian cycle may pre-dispose a driver to sleepiness, exacerbated by sleep deprivation in a recent normal sleep period.
>
> If not circadian rhythm patterns themselves, at: least the ability of the body behaviour and activity to respond to the underlying pre-disposition or pre-condition, may be disturbed or frustrated by abnormal or changing shift: patterns, prefaced by inadequate acclimatisation.
>
> Thus, for example, in exercising vehicle control, aberrant driver steering behaviour, associated with degrees of driver sleepiness, could be recognized and corrected—or at: least a warning issued of the need for correction (by sleep restitution).

This portion of the specification describes the claimed functions but does not disclose the algorithm by which the computational means performs those functions. Here, the specification

discloses that underlying sleepiness condition based on time of day or the driver's previous sleep habits is a factor in the system and that aberrant steering indicates sleepiness, the recognition of which could lead to a warning to the driver. This portion of the specification does not provide the required "explanation of how the computer performs the claimed function." *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1384 (Fed. Cir. 2009) (emphasis added).

3. Table 10

Table 10, titled "Sleep Propensity Algorithm – Definition" is the third location in the specification that Ibormeith contends discloses the required algorithm(s). It provides the following equation:

S mod = S circ + S zerox + S rms + S light + S temp + S sleep + S road + S trip

'749 patent col.12 ll.25-29. Table 10 indicates that the S mod[3] and S circ values are greater than 0 and less than 1 and that each of the other "elementals"[4] is greater than 0. The terms set forth in Table 10 are defined in Table 11.

Table 11, titled "Algorithm Elementals – S," provides as follows:

S mod (S)	Modified Sleep Propensity Factor-Range 0 . . . 1
S circ (S)	Current Circadian Sleep Propensity Value
S zerox (S)	Current Corrective Steering Reversal Rate Deficit
S rms (S)	Current RMS Corrective Steering Amplitude Surfit
S light (S)	Current Ambient Lighting Intensity Deficit
S temp (S)	Current Ambient Temperature Surfit
S sleep (S)	Prior Sleep Good Hours Deficit
S road (S)	Current Road Activity Deficit
S trip (S)	Accumulated Trip Duration

Id. at col.12 ll.45-52. The patent provides no explanation for Table 11. The Court notes, for example, that the "(S)" after each elemental is neither defined nor explained. The patent states

[3] The Court will use these terms without quotations as the parties have done throughout the briefing.

[4] The patent defines these as "elementals." In their briefing, the parties use "element" interchangeably with "elemental." For ease of comprehension, the Court will do the same.

that the twenty-four tables "are generally self-explanatory and will not otherwise be discussed." *Id. at col.*10 ll.34-35. The patentee chose not to explain or discuss the often Byzantine tables. This choice not to discuss such a vast array of unexplained tables does not meet the burden of a patentee to "clearly link[] or associate[] [the] structure to the function recited in the claim." *B. Braun Med., Inc.*, 124 F.3d at 1424. This choice also makes it difficult for a potential infringer to understand the boundaries of the patent's claims.

Mercedes argues that Table 10 fails to disclose an algorithm for performing any of the Claim 1 "computational means" functions.

a) Table 10: first function – "weighting the operational model according to time of day in relation to driver or operator circadian rhythm pattern(s)"

With respect to the first function—"weighting the operational model according to time of day in relation to the driver or operator circadian rhythm pattern(s)"—Mercedes argues that, by including the S circ element, Table 10 indicates that this weighting should occur, but fails to disclose how that weighting should occur. Ibormeith argues that the S circ score itself weights the operation model because that score varies by time of day in accordance with human circadian rhythm. Ibormeith contends that Figure 17 provides the corresponding structure for this weighting function. Mercedes points out that Figure 3, titled "LIKELIHOOD OF FALLING ASLEEP," upon which Figure 17 is based, shows likelihood of falling asleep fluctuating between "1=unlikely" and "4=very likely" throughout a 24-hour cycle and is therefore inconsistent with Table 10, which limits S circ to values between 0 and 1. Ibormeith responds that the patent provides for a choice of scales (0-1 or 1-4) for the sleepiness based on time of day score.

The patent should have more clearly disclosed how the operational model is weighted according to time of day and should have clearly associated Table 10 and Figures 3 and 17 as the

associated algorithm for this claimed function. However, the fact that the S circ score ranges in Table 10 and Figure 3 do not match does not demonstrate by clear and convincing evidence that someone skilled in the art would not understand Table 10 along with Figures 3 and 17 to disclose structure corresponding to the "weighting the operational model" function.

b) Table 10: second function – "deriving, from the weighted model, driver or operator sleepiness condition"

Mercedes argues that Table 10 fails to disclose an algorithm for "deriving . . . driver . . . sleepiness condition." Table 10 does disclose that the listed elements are added to produce an S mod score, but Table 10 does not disclose how to derive that score. Neither Table 10 nor any other clearly identified portion of the specification states the steps to obtain the listed elements' scores, or how to weight them according to their relative importance. For example, with respect to S temp, the specification discloses that "a threshold of some 25 degrees C might be set, with temperatures in excess of this level triggering a score of plus 0.5," *id.* at col.7 ll.56-58, but fails to disclose any steps to adjust or weight that score for any other measured temperature. Similarly, while the S road element appears to correspond to the specification's discussion of road condition, *see id.* at col.7 ll.43-49, there are no disclosed steps to determine a monotonous road condition nor the steps that the steering sensor takes to determine the degree of road monotony. Thus, Table 10 indicates that S road is one of the elements used to "deriv[e] . . . driver . . . sleepiness condition," but fails to disclose any steps by which the S road score is to be derived.

Table 10 also discloses that each element in the equation is calculated using an "F" factor. *See e.g.*, *id.* at col.12 l.35 ("S light = (F light/100) (I ref – I)"). The unexplained Table 12 states names for each of these "Algorithm Weighting Factors – F," but does not disclose how to calculate or derive the values of the "F" factors. Without such identified steps, the patent does

not explain how the various Table 10 elements are to be "individually weighted, according to contributory importance." *Id.* at col.3 ll.39-40. Likewise, for the various "ref" factors stated in Table 10 to calculate each S element, the patent does not disclose actual values or the steps necessary to obtain those values. *See e.g.*, *id.* at col.12 l.35 ("I ref"). While Table 13 states that these "Algorithm Reference Offsets" exist, *see id.* at col.13 ll.12-13 (defining "I ref (kLx) as "Average Ambient Lighting Intensity – Ref Offset[;] Corresponds to moderate daylight"), the patent neither discloses actual values for these reference offsets nor the steps necessary to derive such values. Because this is a means-plus-function claim, these boundaries of the claim belong somewhere in the patent; either in the specification or the tables. For the patent to state that the tables "are generally self-explanatory and will not otherwise be discussed" is simply remarkable. *Id.* at col.10 ll.34-35. Such deliberate vagueness and unwillingness to pin the patent to boundaries of the claims does not disclose an algorithm corresponding to the "deriving . . . driver . . . sleepiness condition." Essentially, Table 10 is a list of unremarkable factors that can cause driver sleepiness and contains the kernel of an idea for a weighting formula, but does not define any method for deriving or weighting several of the elements (i.e., S zerox, S rms, S light, S temp, S sleep, S road, and S trip).

In its opposition brief, Ibormeith does not respond to Mercedes's discussion of these deficiencies in the patent's disclosure of Table 10 and its elements. Instead, Ibormeith argues that "[t]he [Table 10] factors disclose enough to one of skill how to determine a sleepiness condition, and the law does not require the inventors to disclose every detail for a software program." Opp. Br. 12. Ibormeith also argues that "the patent does not require use of all the Table 10 factors," and that "one of the steps in the algorithm for performing the function is

choosing among the available factors." *Id*. Ibormeith cannot point to any language in the specification that states that the elements of Table 10 are optional.

Ibormeith's "optionality" argument is entirely unpersuasive. As stated earlier, a computer-implemented means-plus-function limitation such as the Claim 1 "computational means" limitation requires disclosure of an algorithm by which the computer achieves the claimed function. Table 10 is the only portion of the specification that provides any algorithm-like disclosure; all other cited portions of the specification provide functional and not structural language. Without Table 10, the '749 patent offers no disclosure of how the "computational means" performs the claimed functions. Table 10 defines an equation with a series of added elements, nowhere stating that the addition need not occur: S mod = S circ + S zerox + S rms + S light + S temp + S sleep + S road + S trip. There is no use of any English or mathematical term that is the equivalent of and/or, and nowhere in the specification is it disclosed that the Table 10 equation lists elements that are optional. If one step of the algorithm was for the implementer to choose from among the available elements, as Ibormeith argues, the patent must clearly disclose this step. It does not do so. The patent labels Table 10 the "Sleep Propensity Algorithm – Definition," but it does not sufficiently disclose the steps necessary to actually perform the algorithm suggested by Table 10. Nor does it say anywhere that undefined elements can be omitted as "optional." The drafter of the patent chose not to provide any explanation of the Tables, '749 patent col.10 ll.34-35, and Ibormeith has failed to point out where the specification actually discloses how each Table 10 element is to be weighted and derived.[5] The doctrine of

[5] The Tables accompanying Table 10 offer hints at how the Table 10 algorithm's elements might be obtained, but because the drafter chose to provide no explanation to tie them to the claims of the patent, an accused infringer can only guess at the boundaries of the claim. It is for the patentee to teach; it is not for a court or the potential infringer to speculate as to these values or methods for deriving those values that are required by the Table 10 equation. For example, for the S light element, defined by Table 11 as "Current Ambient Lighting Intensity Deficit," Table

definiteness requires a patentee to stake out his or her territory with clarity and precision and to "clearly link" the algorithm to the claim. Ibormeith has not done that here.

The Court must weigh the patentee's burden to provide disclosure that is "sufficiently precise to permit a potential competitor to determine whether or not he is infringing," *Exxon Research and Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 1991), against Mercedes's burden to demonstrate by clear and convincing evidence that the patent fails to disclose an algorithm corresponding to each claimed function. Here, Table 10 discloses what appears to be a partial algorithm. However, Mercedes has met its burden by clear and convincing evidence to show that neither Table 10, the accompanying tables, nor the remainder of the specification, discloses the necessary steps to be taken by the "computational means" to

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10 provides the following formula: "S light = (F light/100) (I ref –I)." '749 patent col.12 ll.35,48. Table 12, titled "Algorithm Weighting Factors – F," provides some information regarding "F light": "F light (% S/kLx)[;] Average Ambient Light Intensity Deficit - % Factor." *Id.* at col.12 ll.55-65. According to Table 13, titled "Algorithm Reference Offsets – ref," "I ref (kLx)" is the "Average Ambient Light Intensity – Ref Offset Corresponds to moderate daylight." *Id.* at col.13 ll.1-20. Table 14, titled "Algorithm Dynamic Variables," defines "I (kLx)" as "Current Ambient Lighting Intensity." However, for the reasons stated above, neither the patent, nor Ibormeith, nor its expert provides sufficient explanation as to how these accompanying tables disclose the steps required to derive the S light element required by Table 10. Mercedes's experts have opined that neither the specification nor the tables disclose structure sufficient to be understood by one of ordinarily skilled in the art as being adequate to perform the "deriving" function. *See* Declaration of Dr. Ronald R. Knipling in Support of Defendants' Motion for Summary Judgment of Indefiniteness ("Knipling Decl.") ¶¶ 14-22; Declaration of George T. Ligler in Support of Memorandum of Law in Support of Defendants' Motion for Summary Judgment of Indefiniteness ("Ligler Decl.") ¶¶ 18-23. Ibormeith's expert responds, without explanation, that the Table 10 elements are easily understood, though he does not explain how these elements are derived or calculated. *See* Expert Witness Report of Todd Jochem, Ph.D. ("Jochem Rep.") ¶¶ 41-71 (Ex. 2 to Declaration of Jonathan R. DeFosse in Support of Defendants' Statement of Undisputed Facts Pursuant to Local Rule 56.1 ("DeFosse Decl.")). He further states that it is clear that the elements are optional, suggesting that undefined elements are unnecessary but offering no support for this proposition in the patent.

The Court will not on its own go down that path of figuring out the proper interrelatedness of the formulas in the "self-explanatory" tables accompanying Table 10, where neither the patent itself, the patentee, nor its expert has done so.

"derive[] . . . driver . . . sleepiness condition." Therefore, as a separate and independent ground, the Claim 1 "computational means" limitation is indefinite.

c) Table 10: third function – "producing an output determined thereby"

The third and final function of the "computational means" limitation in Claim 1 is "producing an output determined" by the sleepiness condition. Mercedes argues that neither Table 10 nor any other location in the specification discloses a method for performing this function. Ibormeith responds that this function "is simply outputting the result of the sleepiness condition determination so that it can be conveyed to the audio or visual output that interacts with the driver." Opp. Br. 13. Ibormeith points to Figure 17, which shows a curve for S circ sleep propensity based on time of day, with an arrow indicating that S mod might result in an elevated sleep propensity score, and three horizontal lines labeled "Warning Level" 1, 2, and 3. According to Ibormeith, this is sufficient structure for the "producing an output" function even though there is no indication of the numeric value at which these warning levels are triggered. *Id.*

Even if Table 10 were found to have provided a sufficient structure for the function of "deriving . . . driver . . . sleepiness condition" (i.e., the S mod score), it does not provide an algorithm that explains how that score is used to produce an output (i.e., an actual warning to the driver). Figure 17 merely discloses that there are warning threshold levels that can be hit by the S mod score from the Table 10 equation, but the specification does not disclose an algorithm for how the "computational means" determines when and how these thresholds are triggered. In *Aristocrat*, the patentee pointed to certain figures and tables in the specification as algorithms that disclosed the necessary structure for a means-plus-function claim term. The court found that "[t]he figures, tables, and related discussion, however, are not algorithms. They are simply

examples of the results of the operation of an unspecified algorithm . . . at best, a description of the claimed function of the means-plus-function claim." 521 F.3d at 1335. Figure 17 in the '749 patent, just like the figures and tables discussed in *Aristocrat*, does not disclose an algorithm for "producing an output determined thereby"; it simply provides an example of the result of that function. In other words, Figure 17 demonstrates that the S mod score might hit a level that triggers a warning, but it provides no step-by-step explanation of the means by which that function is executed.

"[T]he amount of detail that must be included in the specification depends on the subject matter that is described and its role in the invention as a whole." *Typhoon Touch*, 659 F.3d at 1385. Producing an output based on the derived sleepiness condition is the central function of the monitor claimed by the '749 patent. It is the critical function that would translate the circadian rhythm data, the individual driver's characteristics, and the vehicle sensor inputs into an actual warning output that would notify the driver of the danger of sleepiness. Therefore, the algorithm corresponding to this function must be disclosed with significant detail. Disclosing that warning thresholds exist and that the S mod score can trigger those thresholds does not constitute a sufficiently detailed disclosure of how the computer uses that score to determine when a warning should be issued. "Even described 'in prose,' an algorithm is still a 'step-by-step procedure for accomplishing a given result.'" *Ergo Lic. LLC v. CareFusion 303, Inc.*, 673 F.3d 1361, 1365 (Fed. Cir. 2012) (quoting *Typhoon Touch*, 659 F.3d at 1385). The evidence is clear and convincing that the '749 patent fails to disclose an algorithm for accomplishing the "producing an output determined thereby" function. Accordingly, as a separate and independent ground, the "computational means" limitation in Claim 1 is indefinite.

Because the patent fails to disclose an algorithm that "address[es] [all] aspects of [the] functional language" in the Claim 1 "computational means" limitation, the Court "treat[s] the specification as if no algorithm has been disclosed at all."[6] *Noah Sys.*, 675 F.3d at 1314, 1318. Accordingly, because "the specification is not clear as to the structure that the patentee intends to correspond to the claimed function," Ibormeith "has not paid that price but is rather attempting to claim in functional terms unbounded by any reference to structure in the specification. Such is impermissible under the statute." *Elekta AB*, 344 F.3d at 1211.

B. Claim 9 "computational means" limitation

The parties do not dispute that Claim 9's "computational means" performs three functions: (1) "computing steering transitions[7]"; (2) "weighing that computation according to time of day"; and (3) "provid[ing] a warning indication of driver sleepiness." '749 patent col.16 ll.58-61. Mercedes argues that the specification fails to disclose an algorithm supporting any of these functions. The Court will examine each function in turn.

Ibormeith points to Columns 8 and 9 of the specification and certain Tables as providing disclosure of the algorithm supporting the "computing steering transitions" function. As background, the specification teaches that on "relatively straight road[s] . . . steering inputs of an

[6] The parties have both submitted expert opinions on whether one skilled in the art would understand the patent to disclose a sufficient algorithm corresponding to the claimed functions. Not surprisingly, these experts come to opposing conclusions as to the indefinites of the '749 patent. The Court has considered these expert opinions to a degree and, as discussed above, has found that Ibormeith's expert has failed to refute certain deficiencies in the patent's disclosure pointed out by Mercedes. However, since it has been determined that no algorithm has been disclosed at all, the Court was not required to actually consider the parties' expert testimony. *See Default Proof Credit Card Sys.*, 412 F.3d at 1302 ("[T]he testimony of one of ordinary skill in the art cannot supplant the total absence of structure from the specification.").

[7] The parties dispute the proper construction of "steering transitions." Ibormeith proposes "changes in steering wheel angle," while Mercedes proposes "changes in angular position of the steering wheel of a vehicle that result in a zero crossing." This dispute need not be decided in connection with this ruling.

alert driver are characterised by frequent, minor correction." '749 patent col.3 ll.51-53. Columns 8 and 9 disclose the measurement of steering wheel movement in three different ways: (1) "deviations of steering wheel position from a straight-ahead reference position—allotted a 'zero' value;" (2) "averaged value of steering wheel movement amplitude (ie [sic] the extent of movement from the reference position)—using the RMS (root mean squared) of the actual movements;" and (3) the variability of RMS amplitude. *Id.* at col.8 ll.41-56. According to the specification, "as a person becomes sleepy, zero crossings are reduced in frequency, whereas RMS amplitudes increase and/or become more variable." *Id.* at col.8 ll.54-56. The specification discloses that in measuring zero crossings, there is a plus or minus 3% "'wobble' factor as a 'dead' or neutral band about the reference position." *Id*. at col.8 ll.46-47.

Table 10, discussed above, includes the elements S zerox and S rms, which relate to steering. This takes us to the other tables, which the patentee described as "generally self-explanatory," without further effort to tie the tables to any claim as stated above. *Id.* at col.10 ll.34-35. Table 11 defines S zerox and S rms as "Current Corrective Steering Reversal Rate Deficit" and "Current RMS Corrective Steering Amplitude Surfit," respectively. Table 10 further provides that "S zerox = (F zerox/100) (Z ref-Z)" and "S rms = (F rms/100) (R-R ref)." According to Table 12, "F" represents an "Algorithm Weighting Factor[]." Tables 13 and 14 disclose that "Z ref (#/min)" is "Corrective Steering Reversal Rate – Ref Offset Corresponds to 'Alert' Driving Subject Dependent," while "Z (#/min)," is "Current Corrective Steering Zero X Rate." Likewise, "R ref (Deg)" is "Corrective Steering RMS Amplitude – Ref Offset Corresponds to 'Alert' Driving Subject Dependent," and "R (Deg)" is "Current RMS Corrective Steering Amplitude."

The person of ordinary skill in the art is again left by the patentee to work through Tables 10-14 on his or her own. For many of the same reasons discussed above with respect to the "deriving" function in Claim 1, the patent fails to sufficiently disclose an algorithm for the "computing steering transitions" function of Claim 9. For example, while Tables 10 and 12 state that an "F" weighting factor is used to calculate both S zerox and S rms, the patent fails to disclose any actual "F" factor values or the steps necessary to derive those values. Additionally, Table 13 states that the "Z ref" and "R ref" offsets are "Driving Subject Dependent," yet the patent fails to disclose how these subject dependent reference values are derived or calculated. Because the patent fails to disclose the actual values of these reference offsets or a method to obtain such values, it does not adequately disclose how to derive the S zerox or S rms scores, which are required to "compute[] steering transitions."

Once again, while the portion of Table 10 that relates to steering (S zerox and S rms) appears to disclose an algorithm for "computing steering transitions," the patent fails to disclose the steps necessary to actually perform that suggested algorithm. The drafter of the patent chose not to provide any explanation of the tables accompanying Table 10 or how they interact. Likewise, Ibormeith has failed to point out where the patent discloses the information necessary to derive the required elements of the Table 10 equation. Accordingly, Mercedes has demonstrated by clear and convincing evidence—and Ibormeith has failed to adequately refute—that the patent fails to disclose a sufficient algorithm for the "computing steering transitions" function of Claim 9. Therefore, as a separate and independent ground, the "computational means" limitation in Claim 9 is indefinite.

For the "weighing that computation according to time of day" function, for the same reasons discussed above with respect to the "weighting . . . according to time of day" function in

Claim 1, Mercedes has not demonstrated by clear and convincing evidence that someone skilled in the art would not understand the patent to disclose structure corresponding to claim 9's "weighing" function. *See supra* Section III.A.1 (discussing Table 10 and S circ element).

Mercedes argues that the specification fails to disclose an algorithm for performing the "provid[ing] a warning indication of driver sleepiness" function for the same reasons that applied to the "producing an output" function in Claim 1. In its opposition brief, Ibormeith argues that no algorithm is required for the "provid[ing] a warning indication of driver sleepiness" function because this function is carried out by "hardware separate from the specially programmed processor." Opp. Br. 18. This argument is plainly inconsistent with Ibormeith's argument in its opening claim construction brief, in which it described a "warning algorithm at column 8, lines 1-17" that "uses all of the steering and time of day values to calculate a new value for current predisposition to sleepiness" where that "value is compared to warning threshold values, to determine whether a warning output is triggered." Plaintiff's Opening Claim Construction Brief 23.

Ibormeith argues that the "provid[ing] a warning" function is carried out by a visual display panel and not the "computational means": this argument is unpersuasive. Without a computational means for determining when a warning should be provided based on the time of day and computation of steering transitions, the monitor claimed in Claim 9 would be ineffective. The portion of Table 10 that corresponds to the Claim 9 means-plus-function limitation discloses that the S circ, S zerox, and S rms scores are added to produce an S mod score. "Provid[ing] a warning indication of driver sleepiness" requires a computational means for translating that S mod score into a warning. In sum, the specification's disclosure of a visual display panel relaying warnings to the driver, *see* '749 patent col. 7, ll.1-3, does not provide the

corresponding structure for the "provid[ing] a warning" function in Claim 9. While hardware will surely be involved in the conveyance of a warning to the driver, it does not explain how the monitor determines when the computation of steering transitions and time of day weighing leads to the issuance of a warning. For the same reasons discussed above with respect to the "producing an output" function in Claim 1, the patent fails to disclose an algorithm that supports the "provid[ing] a warning" function. As a separate and independent ground, the "computation means" limitation in Claim 9 is indefinite, because the patent fails to disclose an algorithm that supports all of the claimed functions in the Claim 9 means-plus-function limitation. Therefore, the Court "treat[s] the specification as if no algorithm has been disclosed at all." *Noah Sys.*, 675 F.3d at 1318.

IV. CONCLUSION

For the foregoing reasons, Mercedes's Motion for Summary Judgment of Indefiniteness is **GRANTED**.[8] An appropriate Order follows.

/s/ Faith S. Hochberg
Hon. Faith S. Hochberg, U.S.D.J.

[8] Because the Court's findings are dispositive, it is not necessary to construe the disputed claim terms.